PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 107327AF	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/NO 03/00068	International filing date *(day/month/year)* 24.02.2003	Priority date *(day/month/year)* 25.02.2002
International Patent Classification (IPC) or both national classification and IPC G01G3/14		
Applicant SINTEF ELEKTRONIKK OG KYBERNETIKK et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19.09.2003	23.03.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Stobbelaar, M Telephone No. +49 89 2399-2827

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO 03/00068

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-10 as published

Claims, Numbers

1-18 filed with telefax on 02.03.2004

Drawings, Sheets

1/4-4/4 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: GB-A-2 296 977
   D2: EP-A-1 052 478
   D3: US-A-4 553 436

2. The invention relates to a spring micro scale. Main characteristic of the spring micro scale according to claim 1 is the construction of a load platform suspended with flexural springs extending in succession along the whole periphery of the platform and with attachment spots as defined in claim 1, in combination with a load platform being thin relative to the surrounding frame.
   Such a construction, permitting to obtain compliance adapted to weighing in the micro-range, and insensitivity as to where a load is placed on the load platform, is not known nor suggested by the prior art documents cited in the search report.
   Although from the cited documents D1 - D3 disclose similar suspended platforms, they do not related to micro-scales. D1 and D3 relate to accelerometers, in which the platform is not a thin load platform but a thick weight, in order to provide inertial relative motion to be sensed by the strain gauges. D2 relates to a gyroscope, wherein the platform is not a thin load platform but a vibratory plate. A combination of these documents does not result in an obvious way in the spring micro-scale as defined in claim 1.

   Therefore the subject-matter of claim 1 meets the requirements of articles 33 (2) and 33 (3) PCT.

3. Claims 2-18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Additional remarks

a) Claims 2 and 3 filed with the facsimile dated 02.03.2004 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned in these claims are the functions/effects of the defined characteristics (claim 2: "to obtain insensitivity ... platform"; claim 3: "to provide high compliance ... objects"). It does not follow clearly from the original description, that exactly the defined characteristics in these claims have these functions or effects. Therefore Article 34(2)(b) PCT has been infringed.

b) Reference signs in parentheses should have been inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT.

c) To meet the requirements of Rule 5.1(a)(ii) PCT, the documents D1-D3 should have been identified in the description and the relevant background art disclosed therein should be briefly discussed.

d) The description should have been brought into conformity with the amended claims (Rule 5.1(a)(iii) PCT).

CLAIMS

1. Spring scale, comprising a load platform suspended, by at least three flexural springs, in a surrounding frame, and with bridge-connected strain gauges arranged for measuring strain on one side of said flexural springs, characterized in that the flexural springs extend in succession along substantially the whole periphery of the load platform in a gap between the load platform and an inner edge of the frame, and in that an attachment spot on the load platform for each respective flexural spring is arranged substantially directly opposite or past an attachment spot on the inner edge of the frame for a next flexural spring in the succession.

2. The spring scale of claim 1, characterized in that the load platform, the flexural springs and the frame are shaped as one single micro-machined or etched piece of solid matter.

3. The spring scale of claim 2, characterized in that said piece of solid matter is a silicon piece.

4. The spring scale of claim 2, characterized in that said strain gauges are integral in the piece of solid matter.

5. The spring scale of claim 1, characterized in that the strain gauges are piezo-resistive resistors.

6. The spring scale of claim 1, characterized in that each flexural spring has a strain gauge placed on a crossing between the flexural spring and the frame or the load platform.

7. The spring scale of claim 1, characterized in that the load platform is substantially quadratic.

8. The spring scale of claim 1,

characterized in that the flexural springs lie parallel to respective side edges of the load platform.

9. The spring scale of claim 7 or 8,
characterized in that the flexural springs have lengths substantially equal to the lengths of the closest side edges of the load platform.

10. The spring scale of claim 1,
characterized in that the frame, which preferably has a thickness that is somewhat larger than the thickness of the load platform and the flexural springs, rests on, and is attached to, a substrate extending in under the load platform to work as an end stop for a swing downward of the load platform, said substrate possibly being equipped with a central opening underneath the load platform, for inspection and cleaning.

11. The spring scale of claim 10,
characterized in that said substrate is made of glass, and is attached to the frame by means of anodic bonding.

12. The spring scale of claim 1,
characterized by a roof above the load platform, said roof being attached peripherally on the frame, with a central opening above the load platform for placing objects to be weighed, and with an additional function as an end stop for possible swings upward of the load platform.

13. The spring scale of claim 12,
characterized in that the roof is made of glass, and that it is attached to the frame by anodic bonding.

14. The spring scale of claim 1,
characterized in that the number of flexural springs is four.

15. The spring scale of claim 1,

characterized in that the mechanical structure constituted by load platform, flexural springs and frame, exhibits a four-fold rotation symmetry about a point at the center of the load platform.

16. The spring scale of claim 1,
characterized in that the load platform and the inner edge of the frame have a substantially complementary shape.

CLAIMS

1. A spring micro-scale, comprising a load platform suspended, by at least three flexural springs, in a surrounding frame, and with bridge-connected strain gauges arranged for measuring strain on one side of said flexural springs, said flexural springs extending in succession along substantially the whole periphery of the load platform in a gap between the load platform and an inner edge of the frame, an attachment spot on the load platform for each respective flexural spring being arranged substantially directly opposite or past an attachment spot on the inner edge of the frame for a next flexural spring in the succession, and said load platform being thin relative to said surrounding frame.

2. The micro-scale of claim 1, wherein the strain gauges are all oriented in the same direction, to obtain insensitivity regarding positioning of an object on the load platform.

3. The micro-scale of claim 1, wherein the flexural springs are thinned down to provide high compliance for weighing of small objects.

4. The micro-scale of claim 1, sherein the load platform, the flexural springs and the frame are shaped as one single micro-machined or etched piece of solid matter.

5. The micro-scale of claim 4, wherein said piece of solid matter is a silicon piece.

6. The micro-scale of claim 4,
wherein said strain gauges are integral in the piece of solid matter.

7. The micro-scale of claim 1,
wherein the strain gauges are piezo-resistive resistors.

8. The micro-scale of claim 1,
wherein each flexural spring has a strain gauge placed on a crossing between the flexural spring and the frame or the load platform.

9. The micro-scale of claim 1,
wherein the load platform is substantially quadratic.

10. The micro-scale of claim 1,
wherein the flexural springs lie parallel to respective side edges of the load platform.

11. The micro-scale of claim 9 or 10,
wherein the flexural springs have lengths substantially equal to the lengths of the closest side edges of the load platform.

12. The micro-scale of claim 1,
wherein the frame rests on, and is attached to, a substrate extending in under the load platform to work as an end stop for a swing downward of the load platform, said substrate possibly being equipped with a central opening underneath the load platform, for inspection and cleaning.

13. The micro-scale of claim 12,
wherein said substrate is made of glass, and is attached to the frame by means of anodic bonding.

14. The micro-scale of claim 1, further composing a roof above the load platform, said roof being attached peripherally on the frame, with a central opening above the load platform for placing objects to be weighed, and with an additional function as an end stop for possible swings upward of the load platform.

15. The micro-scale of claim 14, wherein the roof is made of glass, and that it is attached to the frame by anodic bonding.

16. The micro-scale of claim 1, wherein the number of flexural springs is four.

17. The micro-scale of claim 1, wwherein the mechanical structure constituted by load platform, flexural springs and frame, exhibits a four-fold rotation symmetry about a point at the center of the load platform.

18. The micro-scale of claim 1, wherein the load platform and the inner edge of the frame have a substantially complementary shape.